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ABSTRACT

This article describes the Jaime Escalante Math Program, a system that in 1989 helped an East Los Angeles high school set a record by administering over 450 Advanced Placement exams, having administered only 10 tests in 1978. The article is presented in three sections. The first section describes the program, discussing origins and backgrounds: student recruitment, the curriculum, scheduling, textbooks used, past graduates as models of achievement, community resources recruitment, and teaching methods. The second section describes the fundamental principles of the Escalante Math Program. Ideas discussed include student, teacher, and parent accountability, hard work, teacher expectation, love for the students, parental involvement, mutual respect, proper nutrition, and preventing drug use. The final section, on psychology and the schools, proposes that teachers who encourage, discipline, and motivate their students can gain their willingness to work and help the students overcome the obstacles to getting an education that inner-city students face. The conclusion describes a vision of mathematics education program of hard work combined with love, humor, and a recognition of "ganas," the desire to learn and ability to sacrifice that young people have, that will provide an educational pipeline taking students from kindergarten through to college completion. (MDH)

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The Jaime Escalante Math Program

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Innumeracy, the mathematical equivalent of illiteracy, is a growing and serious problem in the United States. Recently much has been written about this problem in scholarly journals, the popular press, and periodicals. The statistics are staggering. Compared to all other industrialized nations, the United States ranks near the bottom in math and science achievement.

In today's technological age, numeracy is essential for the economic well-being of the country. In the high-tech future of the 21st century, not only economics but also possibly our nation's very democratic foundation may rest on the ability of our children to compete in an increasingly global marketplace. Math skills and technical knowledge required to participate in such a society will be far beyond what is needed even today.

In light of this challenge, an article by a fellow NEA member, Jaime Escalante, is a timely offering. It illustrates how an individual teacher can play a part in vastly improving our students' performance. Because of the article's priority, utility, and commonsense, the NEA has endorsed it and reprinted it for the use of our membership. On these pages, you will find articulation of ideas that are essential to quality teaching.

The excellence in teaching that our teachers bring to the task has never before been so crucial to our nation's future. There are many Jaime Escalantes among our membership. Some of these men and women have yet to realize the full measure of their talent and potential. We hope this article will provide all teachers with useful and practical ideas.

Keith Geiger
President
National Education Association

The Jaime Escalante Math Program

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In recent years I have been deluged with questions from interested teachers, community leaders, and parents about my success in teaching mathematics to poor minority children. I am not a theoretician, my expertise is in the classroom and my first commitment is to my students. Nonetheless, I am willing to share my opinions on this subject in the hope that they might be helpful to other professionals in the field of education. I am hopeful this article will provide answers. I have called upon my colleague, Jack Dirmann, Associate Director of the Foundation for Advancements in Science and Education (FASE), to assist in the preparation of this manuscript. Mr. Dirmann and FASE have been essential to the success of my program for more than five years.

Together, we will address two basic questions:

1. "What exactly is the Escalante Math Program in East Los Angeles?"

2. "What fundamental principles underlie my approach to teaching?"

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I. THE ESCALANTE MATH PROGRAM

Origins: The Game of Education

In 1952, while still an undergraduate in La Paz, Bolivia, I began teaching mathematics and physics — first at one high school, then a second, and finally a third. I found early in my career that children learn faster when learning is fun, when it is a game and a challenge. From the beginning, I cast the teacher in the role of the "coach" and the students in the role of the "team". I made sure they knew that we were all working together. In La Paz, in the fifties and early sixties, our "opponent" was the annual secondary school mathematics competition. Our goal: to reign as the champion over all the local schools.

In the eighties and nineties, in the barrio of East Los Angeles, my students chant, "De-fense, De-fense, De-fense" (in this context: hard work, holding up under pressure, not giving your "opponent" an inch), or "Beat ETS!" as they head to the proctored exam room for the Super Bowl of tests: the Advanced Placement (AP) Examination. The ETS (Educational Testing Service) AP Calculus test is the most difficult of all the examinations administered nationally to secondary school students and it gets tougher every year. Less than 2% of high school seniors nationally even sit for the exam. Of all the Hispanics attempting the test nationwide, 25%–30% originate from my program.

Few students today have not been lectured on the necessity and importance of a good education, but the dictum "get a good education" may be too nebulous a message for easily distracted young minds. Their focus easily shifts to other more pressing problems, particularly when they are living in poverty. The AP test provides the formidable outside "opponent" that galvanizes the students and teacher in a united charge toward a tangible and inexorable deadline — the second week of May. Over the years I have found it easy to focus student attention on this challenge and its very real rewards of possible college credit and advanced placement in college mathematics courses.

Not all students who take the test score a "three" or better, which enables them to receive college credit at over 2,000 colleges and universities, but those who sit for the exam have already won the real game being played. They are winners because they have met a larger challenge than any single examination could present. They have attained a solid academic background in basic skills, especially math and science, and are prepared to move on and compete well against the challenges of both higher education and life. Many of my former students who have gone on to college mathematics or calculus courses often call me "Kimo," they say ("Kimo" is the shortened, student-preferred spelling of "Kemo Sabe," the nickname I was given by one of my gang kids in the 1970s), "this was easy after your course."

As the number of students enrolled in my program has grown to between 140 and 200 studying calculus alone, Advanced Placement at Garfield High School has also exploded in other technical subjects such as physics, chemistry, biology, and computers. Many of my students now take two, three, and sometimes even four AP tests in various subjects. In 1989 the school set a record with over 450 AP tests administered in 16 different subjects. By comparison, in 1978, the year before I started my AP program, only 10 tests were administered for the entire school and not one student sat for the calculus examination.

Recruiting Students

A growing number of junior high school students who wish to be part of the program enroll early and participate in their first math class during the summer program at East Los Angeles College

(ELAC) between their ninth grade year (last year of junior high school) and their tenth grade year. Thus, by the time these students enter the tenth grade they are prepared to take geometry. Currently, six Escalante program students are studying math analysis at a local junior high school. By the time they reach the twelfth grade, they will be ready for third-year college math.

I have been able to reach down into the three feeder junior high schools and establish an unofficial recruiting network within their math departments. We are constantly trying to pick out promising kids with *ganas* (*ganas* translates loosely from Spanish as "desire," or the "wish to succeed") while they are yet junior high school students, so that they can enter the program before or just as they arrive at Garfield.

I do not recruit these students by reviewing test scores or grades, nor are they necessarily among the "gifted" or on some kind of "high IQ track," because I believe that tracking is unworkable and unproven as a guarantee that students will be channeled into the program of classes best suited to them. My sole criterion for acceptance in this program is that the student wants to be a part of it and sincerely wants to learn math. I tell my students, "The only thing you need to have for my program — and you must bring it every day — is *ganas*." If motivated properly, any student can learn mathematics. Kids are not born as bad students, however; the school and the student's home and community environment can combine to produce a bad student. The teacher is the crucial point in this equation. It is up to the teacher to bring out the *ganas* in each student.

Today, the junior high school teachers in our locale have a much better idea of what we need for our program. I often tell the following story to show the difference between the attitude of junior high school math teachers when I first started teaching at Garfield ten years ago and their attitude today. In 1979, when junior high school teachers would tell me, "Take Johnny, he's gifted in math," I would almost always ignore them. Such a recommendation was almost a guarantee that I would pass that child over. If the child was in fact gifted, I figured he or she would need less help from the teacher. Secondly, few of the "gifted" were appreciably different from the "average" — except in their ability to score high on tracking tests. Instead, I often chose the rascals and kids who were "discipline problems," as well as those who simply liked math. I found that the "class cut-ups" were often the most intelligent, but were extremely bored by poor teaching and disillusioned by the perceived dead-end that school represented for them. Sometimes they showed themselves to have the most *ganas* when their "learning light" finally switched on.

The Curriculum

A student must have taken and passed the following courses to arrive at exam day and be able to take the AP exam: Algebra I, Geometry, Algebra II, Trigonometry/Math Analysis, Calculus AB (first-year college), and/or Calculus BC (second-year college calculus). (Some students also take Analytic Geometry or a Pre-Calculus class during the program.) Typically, if the student has not previously had any algebra, Algebra I is taken during the first year of high school. In the summer after the tenth grade, students master geometry in an intensive eight-week summer program at ELAC. Algebra II is mastered in the eleventh grade; then, most often, Math Analysis/Trigonometry is conquered during the summer between the eleventh and twelfth grades. In their senior year, students take Advanced Placement Calculus AB. If a student entered high school with Algebra I completed, then the above curriculum is advanced one year, allowing the student to take Advanced Placement Calculus BC (the equivalent of second-year college calculus) during the twelfth grade.

Scheduling

In effect, as one can see from the list of required math courses in the program, these students are cramming six years of math into three calendar years. To accomplish this I fill their young lives with mathematics. I encourage them to spend extra time studying. From the day they enter my program they are expected — and provided the opportunity — to greatly accelerate their exposure to mathematics.

This intense scheduling enables students to overcome their previous lack of academic preparation and poor study habits. The net result is that they spend much more time being exposed to, and doing, math problems than is customary for a high school student — and not just more than most other students in inner city schools, my classes look more like what one would expect to find at any of the most highly ranked public or private schools in the country.

Textbooks

The demand for quality texts has been a cornerstone of the Escalante Math Program. In the seventies I realized that my students would be held back forever unless they had superior textbooks, so I searched for the best and tested many different texts. When I found what I needed, I demanded these texts for my students. Because the cost of such texts was often far greater than the school allowance, I soon found myself in conflict with the administration. I also received my first introduction to Title I. When I went to one administrator to ask for the textbooks I felt I needed to raise the students' scores to even the minimum standard of competency in the routine State and District mandatory testing, I was told, "No, Jaime, those books do not qualify for Title I. They are clearly not remedial." This same individual also told me, in complete seriousness, "Jaime, if you get better te[illegible] scores for these kids then we're not going to qualify for Title I money." I had to fight many protracted battles to convince others that the more expensive books were not an extravagance, but a vital necessity. Finally, one assistant principal, whom I will always remember fondly, told me she would work to get the books for my program.

I believe that math teaching should be peppered with lively examples, ingenious demonstrations of math at work, and linkages between math principles and their real-world applications. Texts which amplify on these kinds of demonstrations are the best for use in my program. In selecting texts, I also work hard to avoid those that might intimidate my students with arcane descriptions. In the minds of students who have had little success in academics, terms such as "algebra" or "calculus" can present an image of difficulty, complexity, and potential failure. Often, I must persuade or cajole non-cooperative or frightened students into believing that they can do well with these subjects. A text that does not offer a gradual approach, which enables the student to understand one concept fully before going on to the next, makes my job much more difficult.

I try to reduce the foreboding image of higher math by using texts which define all the technical terms as they are first presented. The student's confidence is bolstered as his or her knowledge of the subject increases.

Currently, my calculus students each have four textbooks. *Calculus* by Leithold (which is an especially valuable text for its discussion of limits), *Analytic Geometry and Calculus* by Thomas (especially good for word problems, differential equations, and rate of change problems), *Calculus with Analytic Geometry* by Anton (especially for vectors), and *How to Prepare for Advanced Placement Examination — Mathematics* by Barron. The ideal textbook also has a tremendous number of practice problems because practice, practice, and more practice is demanded from each student. Finding enough practice problems has always been difficult, thus I am currently

developing my own texts and practice workbooks for class and homework use that are consistent with the lesson plans of the program

Past Graduates as Models of Achievement

By exposing the students to the success stories of Escalante Math Program graduates and showing that there is an upward route to well-paid, fulfilling careers through higher education, I immerse the students in the concept that they, too, can succeed — not only in high school, but in college as well. This encouragement is extremely vital for some who, before they came to my program, may have never even considered the idea of higher education.

I encourage former students to become involved with my current classes. Graduates who have gone on to complete college and are now successfully employed are invited to come back and talk to the students. Before they do, I tell them, "Talk to the kids for about ten minutes and cover the following four points: (1) the Escalante Program was tough but it helped make college easier; (2) the amount of money you are earning today; (3) tell them to listen to Escalante, their coach; and (4) you were a top student when you were in class." After the graduate has been thanked for the speech and has exited, I ask my students, "What did she (or he) say?" The students tell me; then I look at them with mock chagrin and say, "No way. *You* are better than she (or he) was. *You* are the best; you can do it. You can go to any college that you want."

I also arrange two or three field trips each year to get the students out to high-tech labs or industrial sites, such as the Jet Propulsion Laboratory (JPL) in Pasadena, where math is employed daily in many different kinds of exciting jobs. The fact that minorities can get these jobs, and that higher education creates opportunities for larger financial rewards, is as much the lesson as the demonstration that math is being used in such settings. As I show off one of my proud graduates on the job at JPL, working on the Magellan space probe project, I tell my students, "You can be a big shot, too." The graduate, radiating confidence, is using an understanding of math to make a good living and, at the same time, enjoying a challenging career.

Recruiting Community Resources

Since 1983, there has been a significant increase in the support that I receive from other math teachers, the community college, and philanthropic resources. Initially, I had to recruit individuals who believed in my efforts. In the beginning I identified people who had the potential to help the program. For example, in the mid-1970s a young math teacher at Garfield, Ben Jimenez, was about to leave the profession because his students were out of control. I helped Ben learn to discipline and control his classes, and from then on he was free to concentrate on developing his skills as a teacher. Today Ben Jimenez is an award-winning teacher. He contributes many students to the total number of AP Calculus passes each year and is a vital member of the team.

When I was unable to teach summer school on the campus of the high school in the early eighties I found a new home for my summer program at East Los Angeles College, which is located within walking distance of Garfield. I first gained the support of the private sector in 1983, when the ARCO Foundation became a major partner in the summer program at ELAC. (K–12 public school education for minorities is a top priority in the ARCO Foundation's philanthropic program.) Since that time, ARCO's support has been the financial bedrock of the summer program. Last year the National Science Foundation (NSF) joined with ARCO and made a three-year, private-sector partnership grant that will extend through 1992.

Those funds have enabled me to greatly expand the number of students, grade levels, and teachers in the summer program at ELAC. Through the NSF grant I have recruited four junior high school and four elementary school teachers for the summer program. These teachers joined me in small seminars last summer to learn how to motivate students in the K–9 grade levels to study math.

I enlisted the support of FASE in 1984. Their efforts have resulted in vital elements such as copiers, special supplies, audiovisual aids, computers, tutor awards, transportation and lunches for students during extra study periods, tee-shirts, caps, team jackets, and scholarships. FASE's support has expanded into a series of motivational videotapes, called "FUTURES," which feature real classroom scenes of my teaching. These tapes will be available to all schools in 1990 through the Public Broadcasting System. I know that I can call FASE at any time, day or night, and get whatever I need for my program. FASE raises funds for the program each year from a wide range of companies and foundations including ARCO, Xerox, IBM, GTE, and the Carnegie Corporation of New York. Many other donors, both large and small, also ensure that my program is empowered to serve the maximum number of minority students.

TEACHING METHODS

Since my first year of student teaching in Bolivia I have felt an obligation to make myself a better teacher and to profit from my mistakes. As an undergraduate I was closely watched, apprenticed, and critiqued by an experienced teacher. Under his critical eye, I abandoned unworkable ideas and came to understand the importance of becoming much more communicative with the students and not simply working at the blackboard all day. This kind of practice teaching under a proven teacher is vital.

There are many traditional and practical teaching methods which are based on common sense — workable methods. I believe we teachers should devote more time identifying and implementing techniques that have withstood the acid test of classroom performance and less time "experimenting" in our classes. If we were to study the methods of a hundred very effective teachers, my guess is that we would find their approaches to be rather simple and direct, with many common denominators. As for myself, I only use those ideas which have proven worthwhile by demonstration and which I have tested. I test everything that comes to me before using it, no matter how vaunted the authority who invented it, and I strongly suggest that other teachers do the same. I always have to laugh when someone suggests that my program is dependent upon one teacher's personality (my own) and could never serve as a model for use in other schools. It just shows how far away we have drifted from the fundamentals of teaching.

The Team Approach

I greatly admire the discipline of athletic teams and the devotion to practice and drilling that sports, the drill team, and the school band are able to command from American high school students. I often use professional sports superstars as examples of successful self-discipline, outstanding performance, the will to win, persistence in the practice of their skills, and other qualities. The walls of my room are covered with posters of sports figures in action. Jerry West, Wilt Chamberlain, Magic Johnson, Kareem Abdul-Jabbar, and Babe Ruth are but a few examples. Before class, my AP Team has "warm-ups" (hand clapping and foot stomping to the rock song "We Will Rock You," played over my Bose loudspeakers). They wear classy satin team jackets, caps, and tee-shirts, and their "practice schedule" is as rigorous as that of any championship football team. These are all part of my effort to make math fun, a team activity. I believe that if I do not make mathematics a lively challenge to my students, then the

subject will continue to seem dry and stale as it has for so many decades, indelibly linked to images of pocket slide rules and "brainy" kids

I often use language, including terms from sports, to create a sense of action, comradery, and competition among the students. For example, the AP Calculus test is referred to as the "Olympics." When a student fails test after test, he or she is sent to "ICU"—the "intensive care unit"—which is a special, less desirable section of the classroom. Students in ICU must attend special after-school study sessions until their test scores improve. Understandably, students are highly motivated to perform their way out of ICU. To simplify and enliven the image of math and to soften the initial impact of new math concepts while making them easier to remember, I sometimes invent terms of my own. I use fun or commonplace substitutes for real math terms until the student's familiarity makes the actual term less imposing. The following are some examples of "Escalantese":

- "face mask": a mistake at the problem's beginning
- "gravy": simple substitution
- "marching band": look at the example in the book and follow it exactly
- "green light": easy factoring
- "red light": difficult factoring, stop and analyze
- "secret agent": the minus sign in front of a parenthesis which has the power to change the signs of the numbers inside
- "rifle pass from Magic Johnson": straight line
- "three-point shot": parabola
- "skyhook from Kareem Abdul-Jabbar": parabola with a different coefficient
- "illegal defense": you cannot divide by zero

The team concept goes beyond jackets, warm-up routines, and preparing for the "Olympics". I often break the students into groups to solve lecture problems by pushing their desks together in small enclaves. After school, the students almost always work in teams.

Experienced students who have contributed to other team members are designated as "TAs" (teaching assistants). They receive nominal pay for their efforts from funds that Jack Dirmann and I raised from the private sector. In this way, my students can earn money tutoring math and forego minimum wage work in local restaurants, dry cleaning establishments, or metal plating shops. This also ensures a ready pool of more experienced students who can "buddy up" with younger students and help them through the difficult spots. An additional benefit to the older students is the opportunity to serve and to repay the program for some of the help that they themselves received, as well as gain exposure to the joys of teaching another and seeing the light of understanding turn on. Much to my delight, several graduates of the Escalante Math Program have pursued careers in education.

Humor

I learned early in my career that teaching is fun — at least, it should be fun. Students learn better when they are having a good time. While I teach respect and discipline and I demand a great deal of hard work from my students, I always try to do it in a way that is fun. I use toys, tell lots of jokes, and let the kids participate. A teacher must enjoy his or her work and convey that joy to the students.

I have found that humor carries ideas much better than a grave monotone because it makes its recipients far more willing to receive what the teacher has to say. In fact, I have heard that some students enroll in my program just because they heard it was fun, despite having little initial interest in mathematics. That does not bother me, however — usually, the interest will follow.

Classroom Organizing and Planning

My preparation for my classes is intense and I must maintain a high level of

organization to back it up. I have a row of file cabinets filled with color-coded sections. Every lesson plan for each day of the year is filed in sequence; every subject is covered. I prepare each quiz, homework assignment, and practice session before the school year even begins, so I save a great deal of time during the year. This allows me to spend time and energy working out a more important problem: exactly how to present a particular concept and spark interest, considering the personalities and preparation of my students and the chemistry of a particular class.

II. FUNDAMENTAL PRINCIPLES OF THE ESCALANTE MATH PROGRAM

Accountability

Teaching has its products, as does any human endeavor. High on the list of products of good teaching are graduates who know their subjects and who are well prepared for higher education, or who are ready to contribute in the work force. Further, these graduates should have sufficiently strong learning skills to be able to educate themselves, and reeducate themselves if need be, throughout their lifetimes in this technologically changing world. If graduates of my program are not able to do this, then I am responsible. I may not be solely responsible for their success or failure, but that is the attitude with which I approach my work. The students and their parents are also responsible. We must hold these parties — the teachers, the parents, and also the school administration — 100% accountable for the product, good or bad, that comes out of our schools. We can do better than we are doing today.

Hard Work

Students who enter the Escalante Math Program must sign a contract which binds them to participation in the summer programs held at ELAC, strict completion of daily homework, and attendance at Saturday morning and after-school study sessions. The students' parents are also required to sign the contract. I sign it as well, obligating myself to bring *ganas* every day and to do everything possible to help the student succeed.

The key to my success with minority youngsters is a very simple time-honored tradition: hard work, and lots of it, for teacher and student alike. To avoid merely stating a cliché and having its relation to my success overlooked, I will provide some examples.

One can find many of my students still working in my classroom (a converted music hall) at 4:00, 5:00, or even 6:00 p.m. each weekday and as early as 7:00 a.m. in the morning. No student with a question or a confusion is allowed to go home with it unresolved. "Come after school and see me at 3:00 p.m.," is the answer for the student who is falling behind, who did not do his or her homework, or who is having difficulty with that day's assignment. Because I am willing to put in the time, my students, one by one, develop a similar willingness. Soon, they learn to *enjoy* the subject of mathematics and happily volunteer to devote their free time to more practice.

The movie *Stand and Deliver* brought home several important points. First, no one expected severely disadvantaged barrio students to achieve academic excellence. The movie also revealed that some educators hold the false and racist idea that Hispanic students are not as smart as some others, and that they shy away from courses that require hard work. It also showed how an even more insidious prejudice leads to a prevailing opinion that requiring academic excellence from poverty-level students presents a grave risk to their "fragile" self-esteem. Such a

demand, according to the nay-sayers, would be one stressor too many for young lives already bowed under crushing poverty, inequities, and hopelessness How could they be expected to cope?

I am happy to say that our program has proved that logic to be faulty When students of any race, ethnicity, or economic status are expected to work hard, they will usually rise to the occasion, devote themselves to the task, and do the work If we expect kids to be losers they will be losers, if we expect them to be winners they will be winners They rise, or fall, to the level of the expectations of those around them, especially their parents and their teachers

I am adamant about the importance of math in the developing lives of these young men and women (the majority of my students are female) Not only do I demonstrate a passion for the subject, I also preach its significance in their futures "Where is the money?," I ask my students "It is in physics, computers, biology, chemistry, and electronics What is the language for all of these subjects? The language is mathematics — and if you know the language you can do anything " I further tell them, "I'll make a deal with you you sign the contract and I will teach you math You can go to college and sit in the first row, because you're going to know more than anybody "

I admit that I am jealous of my students' time and the distractions which compete with my math program I discourage them from filling their schedules with TV, sports, or other forms of "goofing off " I chide them for the headsets which pipe strains of "heavy metal" guitars into their ears when they should be working on math I play good "defense" for my program, too When I have to tackle aspiring athletes who want to drop calculus so that they can go to football or marching band practice, my argument is simple in the 16 years that I have been at Garfield, not one graduate has gone on to make a living playing football, basketball, or baseball Of course, if I were at a school renowned for turning out top professional prospects, I might have to moderate my views, even though in such schools the percentage of students who go on to pros is still very small From where I sit, however, I know that taking AP Calculus has a lot more to do with my students' future success than any ball or baton a student will ever pick up

Demand

I do not give up on my students and I expect them not to give up I do not allow them to be losers I demand that my students perform their assigned tasks and I accept no excuses why those tasks cannot be done If a student continuously fails to perform, I roll up my sleeves and find out what is behind that failure At times the cause lies outside of the classroom In such cases when it is obvious that the child is really willing, and when there is no way that he or she can overcome the obstacle alone, help may involve working with the family, the family's minister or priest, or other assistance agencies

Love

I exhibit deep love and caring for my students I have no exclusive claim to these attributes, they are as natural as breathing to most parents and teachers The power of love and concern in changing young lives should not be overlooked

A few months ago I surveyed a large number of students in each of my six classes I asked them, "What do you want from your parents?" There was a variety of answers, but those that appeared most often really surprised me and made me think twice They were

(1) unconditional love, that is, with no strings attached,
(2) peace at home,
(3) to be understood,
(4) trust, and the freedom of choice that such trust implies

I believe that unconditional love must be extended to each student This happens when a teacher loves to motivate and

teach the difficult students as well as the good ones. I make sure that my students know that I believe in them. I know that the strong intention I communicate to them to succeed must be great enough to overcome the combined negativity of their previous failures, the prejudices of others who predict their likely future failures, and the lack of preparation in mathematics with which they are burdened after nine years in our education system.

I am extremely critical of the teacher who lifelessly copies assignments taken perfunctorily from the teacher's edition of the textbook onto the board each day. Such a teacher is letting the students down by failing to bring life to the classroom. Kids get so bored with this kind of teacher that they soon come to view school as merely a jail sentence with lectures.

Similarly, a teacher must be a lively listener and work to understand what the students are thinking and saying. This requires a genuine interest in the students and a willingness to listen. As parents and teachers, we must make the extra effort to extend ourselves; teenagers can make themselves very difficult to reach at times. You would be surprised how much one learns in this way about their language, music, problems, embarrassments, and aspirations.

I had a student last year who was doing poorly and who was frequently nauseous, exhausted, and apathetic in class. I had no idea what was wrong and, even worse, he would not share with me what was bothering him. I refused to simply shrug it off with "I don't have time" and give up on him. One day after school I decided to follow him and see what was up. I found that the student had a secret part-time job working in a fur cleaning establishment. Every day, without knowing what he was doing, this 16-year-old boy was rubbing toxic solvents used in the cleaning process into his hands. This was the source of his malaise.

I threatened to report the owner of the cleaners to the authorities, yet nothing changed. Finally, I called the Occupational Safety and Health inspectors and the place was shut down. However, without his part-time job the kid was flat broke, so we made him a tutor and gave him a little stipend. He graduated from high school and is going to college today.

The communication of love to one's students goes further than just caring and listening. It also means that I must be willing to repeat an idea, concept, or term as many times as needed for the student to understand it. I have to make sure that every kid is listening to me and watching me when I teach, so that they do not miss a thing. There is no perfect approach that works for every student, so I am continually developing new ways of conveying ideas. That is one reason why I spend so much time at the job: to ensure that what I have said to the group is actually understood by each individual, I feel obliged to communicate to each kid personally. I am always looking for ways to make things easier for them to understand and looking for gimmicks or toys to motivate or to demonstrate an idea. I can't let the kids be bored with or disinterested in mathematics — too many other things in life are dull. I find out what bugs students and what switches on their "learning light." I learn their dreams, and I believe that I am here to assist each of them to realize these dreams.

Parental Involvement

The school alone cannot be expected to educate the children. Parents must help. This is more difficult now when both parents work to support the family, one or more parents is missing from the home, or the parents do not have a personal belief in the value of education for their children. However, I have had great fortune in mobilizing the majority of parents in my community toward the common purpose of helping their children. Parents must sign the same contract that their son or daughter signs, pledging that they will uphold their part of the deal. At the first sign of any trouble with a student, I am on the phone to the parents.

asking for their help. At night or on the weekends I often visit parents to enlist their support for the unusual scheduling requirements of my program.

To succeed, a program as intense as mine must have 100% support from the parents. While most parents are thrilled to have a teacher show so much interest and welcome the opportunity to do anything for their children, sometimes my efforts to help the student succeed take me beyond the usual parent-teacher relationship. One time I even scolded a parent who was drinking too much and harassing his child. "You cannot do that," I told him. "It is interfering with your daughter's math class. She is unprepared and does not do her homework. Math comes first as long as she studies with me, so you will have to stop drinking." More than once, this startling communication of priorities has had a salutary effect on a domestic problem that, left unhandled, would have threatened the student's ability to concentrate and learn. When the local press reported recently that I might be leaving Garfield, partly due to what I felt was a disappointing lack of support for academics on the part of some parents, I was surprised but gratified to see scores of parents, along with former and current students and other members of the community, come to the school to demonstrate their support for me to continue.

Respect and Values:

In the inner city, the decision to make the school a safe haven of learning must be renewed each year — by teachers, parents, and administrators alike. Only thus can we achieve drug-free schools whose mission is solely to teach the students. The failure to do this was epitomized by the situation at Garfield when I first arrived. Graffiti, crime, teen pregnancy, and drugs were prevalent. Drug dealers and gangs haunted the halls. In an effort to promote understanding, and as a sign of trust, the principal at the time even gave the gang leaders keys to his office! Later, a new, hard-nosed principal, Henry Gradillas, decided to stand up. He drove off the gangs, and the dealers, and cleaned up the graffiti.

I often have said that I am trying to give my students two things: "roots and wings." I feel a great responsibility to teach my students respect for values that will sustain their family, their school, their community, their race, their culture and their country; to a large extent, students discover their cultural heritage in the classroom. I often have the class salute the American flag. I teach the kids manners if they lack them. As teachers, I believe that we must ask ourselves who is going to show these children right from wrong if we do not? I don't merely teach math, I teach respect for American democratic values and institutions such as the right and duty to vote.

We owe it to our succeeding generations to ensure that the students learn these things and become full participatory citizens of our country. With these "roots" firmly in place, they are more likely to develop "wings" to success, even greatness.

Nutrition

Proper nutrition is very important. Proper daily nutrition is a proven, common-sense practice which must be cultivated as part of any successful educational program. I believe that if more attention was paid to what kids eat and to ensuring that they were properly nourished before and during class each day, we would see real dividends in student performance everywhere. If I find that my students are not eating well due to poverty at home, bad dietary habits, ignorance, or laziness, I try to remedy the situation. I have raised money from private, corporate, and federal sources to ensure that my students eat properly. I give students lunch coupons or money for food; if necessary, I call their parents. During the summer I spot-check lunch trays to ensure my students are eating wholesome foods and not just junk.

Preventing Drug Use

Drug use is a barrier to classroom performance which deserves the attention of administrators, parents, and teachers. I do not condone the use of drugs of any kind by my or other students — including cigarettes, alcohol, or school-administered Ritalin, as well as marijuana, LSD, and cocaine. Our schools need to work harder to educate our children on the dangers of abusing themselves with these substances. Education on the harmful physical, mental, and spiritual effects of drugs will go a long way to bolster students' determination to stay away from them.

PSYCHOLOGY AND THE SCHOOLS

"Adjusting" to Failure

The children of the barrio have enormous obstacles to overcome in order to get an education. Most of the families of the children I teach at Garfield have incomes below the poverty line. The majority of the parents have not been to college — frequently, Mom and Dad have never even been to high school — and they may or may not fully appreciate the long-term value of education. Many do not know how to provide a supportive atmosphere for serious study, and often they may require the child to get a job to help support the family. Teen pregnancy, drugs, and the stresses upon single-parent homes are all terribly real problems for these students. Gangs operate openly in their neighborhoods.

Are my students affected by these barriers? Of course. Are my students the victims of these barriers? No. None of them. The educational process begins at this point. A would-be teacher who cannot get to this starting point in the field of education should perhaps enter some other field. The future of our children is too important to be entrusted to someone who already agrees with the notion that the world is bigger than the man or woman, that students will hit an insurmountable barrier, that the road to success is engineered by fate and paved with lucky charms.

Students, by definition, can learn to overcome any barrier they will ever face. By definition. "*Ganas* is all I need" is the motto I give my students. I tell them that once they have *ganas*, learning is easy. "Calculus need not be made easy," says the sign in my classroom. "It is easy." I also have a sign underneath the classroom clock (because my students have a tendency to look at the clock). That sign reads: "DETERMINATION + HARD WORK + DISCIPLINE = THE WAY TO SUCCESS." Whenever I catch a student gazing at the clock, I ask gently, "What does it say?" Invariably the student will insist, "I was reading the sign, sir, not looking at the clock" — at which point I respond with, "Oh, I see." Then I will ask them again, indulgently, "What does it say?"

So what does all this have to do with psychology? Although I have never studied the subject of psychology intensively, in my experience, two major effects of the influence of psychology in education have been (1) to weaken the certainty of students that they can overcome the barriers they face and (2) to obscure and skew, by the introduction of uncertain data and purposes, the subject of education itself. In Bolivia, teachers were not trained in this subject. In America, where I was required to take some psychology courses in order to gain a teaching credential, I could never see the relationship between what was taught in these classes and the purpose or activity of teaching. (There was and still is a class called "Magic Circle" based on a psychological approach to communication which I never understood, and to this day do not.) Due to my unfamiliarity, I may speak imprecisely about this subject, however, having had some success nurturing more than one problem child, I can say with equal parts humility and resolve that I am disturbed by what I see as a tendency to view schools as "clinics." The

children are in school to learn, and they can learn quite well if teachers and counselors attend solely to that purpose.

Too often, however, I find that our school counselors and psychologists, in a misguided attempt to help, accept the very real disadvantages faced by poor minority students as excuses for their failures. They rush to help them "adjust" (that is, accept their "limitations"), or they get them so preoccupied with personal problems that the learning objectives become even more inaccessible. The "psychological" approach has been to make fewer demands on disadvantaged or minority students. This practice is actually quite cynical, and can be a death blow to their dignity and *ganas*.

For example, I once asked a student, "Where's your homework?" He said, "I didn't do it. I had a bad dream." I replied, in Escalantese, "I don't care. You have got to do your homework or else you don't have a ticket to see the show" (which meant that because he did not have his daily homework assignment to deposit in the homework basket, he could not even gain admittance to my classroom). The student came back later with a note from a school counselor, who I am sure thought he was acting humanely and in the student's best interests. The note said: "Johnny did not do his homework because he had a bad dream." I told the kid in no uncertain terms, "You do the homework or else you get an F. Period." Miraculously, the kid and the homework appeared the next day and he went through the program not with a residue of resentment, but with a sense of accomplishment.

Two years ago our class was surprised for a few minutes by an earthquake. While I am as afraid of earthquakes as the next person, common sense tells me that it is unwise to scurry around in their aftermath frightening impressionable young people by asking if they are still worried about them. Thus, I refused to allow a solicitous psychologist, who was part of a team sent in to lecture our students on "post-traumatic stress syndrome," to speak to my kids. I imagined the "lesson" which children lectured on "post-traumatic stress" would take away from such incidents. What a hopeless state of mind it must engender in a child, if memories of earthquakes and bad dreams are such formidable opponents, what depths of apathy must engulf a child confronted by the constant specter of drug abuse, gangs, crime, poverty, illiteracy, broken homes, and racial prejudice?

Children dealt with in such an indulgent fashion soon learn that it is impossible to change or improve in the face of so many enormous obstacles that are out of their control. I believe that the recuperative power of young people is great if they are given a little boost in the right direction. So I devised a more workable (and less expensive) remedy — an educational remedy. After the quake I gave my students extra homework and doubled their quiz load. Soon "earthquake stress" was no more than a faint remembrance and my students were moving toward their goal, far too preoccupied with the challenge of math to find time to dive into complexes or other excuses.

Yes, the barriers disadvantaged or minority students face are substantial, but it is the very possibility of their remaining trapped by them for an entire lifetime which requires that such students be urged to succeed in their academic studies. It may be their only way out. If students have not been taught that they are the "victims" of their environment and that they must, therefore, adjust to it, then teachers can gain their full willingness — and strength — to overcome whatever obstacles they face. Admittedly, there are those extremely rare children with such severe problems that they are unable to become successful students, but given admiration, discipline, and encouragement, even "impossible" children will sometimes surprise everyone and "miraculously" begin to perform at higher levels.

A Questionable Mix?

It is not at all clear to me that the fields of psychology and education mix well

Teachers teach. They provide students with the understanding and the ability to *do* something, to achieve a goal. And this — teaching — is something most people *can* learn to do well. In my opinion, psychology as applied in education is still in the experimental stage. We have mystified the learning process (for teachers as well as students) by accepting psychological theories into the field of education. While we know more today, are we *teaching* better in the last 100 years, since psychology undertook to clarify the subject of learning? I think not. Teaching is a noble profession and it has been for centuries. It can be improved, it should not be alloyed.

In mathematics we study the fantastic accomplishments of ancient cultures and classic applications of mathematics and physics. The incredible achievements of the ancients suggest that their teachers understood teaching well. Perhaps we should devote more time to identifying and implementing teaching methods which get results. We should teach teachers workable methods of teaching and allow them to use any methods which result in competent, happy students who are rapidly acquiring the knowledge and skills they need to succeed.

A teacher is a teacher when he or she identifies a student's strengths and activates the student's potential to learn. Later, if teachers want to study various psychological theories regarding learning and behavior, then that is their prerogative; but first we should prepare teachers who can teach.

CONCLUSION

Even though I believe that it is really very easy to teach math to young children, many of my students have a great deal of distance to make up because their first years of training in mathematics are very weak. Many are well below grade level in math when they first enter high school. I do not know why this is so, sometimes I feel that educators and parents think that they would be hurting these students if they demanded more of them at an early age. Also, the idea that higher math is just too tough is one that is widely shared by adults as well as children. However, even in the first grade, students could be learning much more math, and they would enjoy it if someone really wanted to teach them and took the time to do it.

For years I have envisioned an educational "pipeline" for children in East L. A., a program of mathematics training running from kindergarten right through to the completion of college. Last summer we witnessed that dream taking shape. Today, kindergarten children in this community can become part of a high-achievement math program that graduates up through the school levels, with support linkage at each successive school transition.

The Escalante Math Program has had an impact on the entire student body at Garfield. There were no more than six Algebra I classes when I arrived at the school in 1974; today there are more than 25. There were then 10 Geometry and Algebra II classes and now there are nearly 30. Certainly, the pipeline at Garfield today is much wider, its students are uniformly studying more math, regardless of whether they happen to participate in my program or not. As my program has expanded and become well known throughout the educational community, its success has filtered down to the three junior high schools that feed new tenth graders to Garfield. Increasingly, enrolling students have had some exposure to algebra before the tenth grade. This is a sign of academic improvement in our local junior high schools.

I have described the elements of my program. I believe that they can be duplicated elsewhere with ease. The key, for the teacher as well as for the student, is hard work. Hard work makes the future. When hard work is combined with love, humor, and a recognition of the *ganas* — the desire to learn, the ability to sacrifice, the wish to get ahead — that burns in our young people, the stereotypes and the

barriers begin to crumble.

While I have been blessed with hard-working students, there are many teachers with abilities far greater than mine, who work as hard as I do but have not yet been granted the recognition they deserve. It is time they received the full support of their schools and their communities. Our society depends on these people to cultivate the young men and women who will shape our future, and they deserve every possible assistance.

Finally, my thanks go to my present and former students, their parents, ARCO and its ARCO Foundation, East Los Angeles College, my fellow math teachers, and the administrators at Garfield High School who have supported my efforts. Each of the above has contributed to my success. I would not have been able to manage 500 inner-city students successfully through the Advanced Placement (AP) Calculus test in the last 10 years without the help of this team.

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FUTURES is available for instructional broadcast lease from the PBS Elementary/Secondary Service, 1320 Braddock Place, Alexandria, VA 22314, (703) 739-5402. (Educators should contact the Learning Services Director at their local PBS station to determine if they are airing the series. If not, schools, school districts, and education agencies with satellite dishes may lease the series from PBS/ESS for instructional broadcast use.
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